WHAT IS CLAIMED IS:

1. A method for forming a capacitor of a semiconductor device comprising the steps of:

forming an interlayer insulating film on a semiconductor substrate formed with a bit line,

forming a contact plug in contact with the substrate within the interlayer insulating film,

forming a storage electrode on the interlayer insulating film in such a manner that the storage electrode comes in contact with the contact plug,

forming a dielectric film composed of a single composite film of $Ta_2O_5(X)Y_2O_3(1-X)$ on the storage electrode according to ALD (Atomic Layer Deposition) technology,

depositing a diffusion barrier film on the dielectric film, and

forming a plate electrode on the diffusion barrier film.

2. The method according to claim 1, wherein the step of forming the dielectric film comprises the sub-steps of:

repetitively depositing a Ta_2O_5 thin film and a Y_2O_3 thin film in alternation to a predetermined thickness with ALD technology,

performing low temperature annealing of the alternately

deposited thin films to convert the thin films into a single composite film,

performing N_2O plasma annealing of the converted single composite film to remove carbon and impurities contained within the single composite film, and

performing furnace annealing of the N_2O plasma annealed single composite film to crystallize the single composite film.

3. The method according to claim 2, wherein the Ta_2O_5 thin film is deposited to a thickness of less than 10 Å by alternately injecting $Ta(OC_2H_5)_5$ source gas and H_2O reaction gas into a reactor at a temperature of 250 to 350 ℃ according to ALD technology.

4. The method according to claim 3, wherein inert gas is injected at a period of time between that of injecting the $Ta(OC_2H_5)_5$ source gas and that of injecting the H_2O reaction gas so as to leave no residue of the source and reaction gases.

5. The method according to claim 3, wherein each injection of the source gas, the inert gas and the reaction gas is performed for 0.1 to 10 seconds.

6. The method according to claim 2, wherein the Y_2O_3 thin film is deposited to a thickness of less than 5 Å by alternately injecting yttrium source gas and H_2O reaction gas into a reactor at a temperature of 250 to 350 ℃ according to ALD technology.

7. The method according to claim 6, wherein inert gas is injected at a period of time between that of injecting the source gas and that of injecting the reaction gas so as to leave no residue of the source and reaction gases.

8. The method according to claim 6, wherein each injection of the source gas, the inert gas and the reaction gas is performed for 0.1 to 10 seconds.

9. The method according to claim 3, wherein in the deposition of the Ta_2O_5 thin film and the Y_2O_3 thin film, O_2 or N_2O gas is injected as the reaction gas in place of H_2O.

10. The method according to claim 4, wherein any one selected from the group consisting of N_2, Ar or He is injected as the inert gas.

11. The method according to claim 2, wherein the Ta_2O_5 thin film and the Y_2O_3 thin film are repetitively deposited in alternation up to an overall thickness of 100 to 200 Å.

12. The method according to claim 2, wherein the deposition ratio between the Ta_2O_5 thin film and the Y_2O_3 thin film is X:(1-X).

13. The method according to claim 2, wherein the low temperature annealing is performed at a temperature of 400 to 550 ℃.

14. The method according to claim 2, wherein the N_2O plasma annealing is carried out in a rapid thermal annealing mode in which annealing temperature is 300 to 400 ℃, annealing time is 60 to 180 seconds and N_2O gas flow rate is 10 to 100 sccm.

15. The method according to claim 2, wherein the furnace annealing is performed at a temperature of 600 to 850 ℃ for 5 to 60 minutes while N_2, O_2 or N_2O gas flowing in a furnace.

16. The method according to claim 1, wherein the

diffusion barrier film is a TiN film.